ABSTRACT

In this study, mesoporous molecular sieve (MMS) was synthesized hydrothermally with addition of fumed silica to determine its physicochemical properties by means of x-ray Diffraction (XRD) patterns and Nitrogen adsorption-desorption isotherms. The physicochemical properties of the synthesized MMS were compared with the commercial MCM-41. From the comparison, MMS which have the desired characteristics were chosen to undergo post-treatment processes. The post-treatments were calcination at 500 and 700 °C; and ion-exchange with ammonium hydroxide (NH_4OH). The treated MMS were characterized by Nitrogen adsorption-desorption analysis, Fourier transform infrared (FTIR) and temperature programmed desorption with ammonia (TPD-NH_3). The effects of post-treatments on the physicochemical properties of the treated MMS were observed on the liquid product distribution from pyrolysis of High Density Polyethylene (HDPE) in order to produce fuel-like liquid products. Sodium silicate, fumed silica, trimethylammonium hydroxide, nitric acid, water and hexadecyltrymethylammonium bromide was used for the synthesis. The samples were left in oven at 120 °C for 3 to 7 days. It was found that the samples show mesoporous materials characteristics indicated from XRD and N_2 adsorption-desorption isotherms. The surface area of samples reduced extremely after calcination at 700 °C. However, its pore diameter reduced gradually which indicates the added fumed silica increased the thermal stability of samples. From the liquid product distribution of HDPE pyrolysis, when the calcined samples was ion-exchanged with NH_4OH, the liquid production increased tremendously more towards gasoline-like compounds from 3 % to 17 % for sample calcined at 500 °C and from 6 % to 27 % for samples calcined at 700 °C. Thus, it can be said that addition of fumed silica in the preparation of MMS changes the physicochemical properties of prepared catalyst. In addition, various treatments on MMS also can contribute to the pyrolysis of HDPE product distributions towards the preferred liquid products.

DEVELOPMENT OF MESOPOROUS MOLECULAR SIEVE FOR PYROLYSIS OF HDPE TO PRODUCE LIQUID FUEL

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